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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/715,935
Filing Date: November 17, 2000
Appellant(s): BI ET AL.

Peter S. Dardi
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed March 24, 2005 appealing from the Office action mailed November 23, 2004.

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(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

This appeal involves claims 18-54 and 56-61.

Claims 1-17 and 55 have been canceled.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner. The rejections based on Rao in view of Bernecki have been withdrawn, in view of the applicant's arguments filed in the appeal brief. However, this does not affect the status of any of the claims, because these rejections were all in duplicate.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

6,280,802	AKEDO et al.	8-2001
5,958,348	BI et al.	9-1999
5,874,134	RAO et al.	2-1999
6,097,144	LEHMAN	8-2000
6,074,888	TRAN et al.	7-2000
WO 99/23189	KAMBE et al.	5-1999
6,032,871	BORNER et al.	3-2000

5,744,777	BERNECKI et al.	4-1998
4,011,067	CAREY, JR.	3-1977

(9) Grounds of Rejection

The following grounds of rejection are applicable to the appealed claims:

Claims 18-29, 33-42, 44, 46-51, 56-57, and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akedo et al. (US 6,280,802 B1) in view of Bi et al. (US 5,958,348) and Rao et al. (US 5,874,134).

Akedo teaches a film forming apparatus that directs a particle stream made up of nanoparticles towards a substrate and moves the substrate relative to the particle stream in order to coat the substrate (column 3, line 10-12). The input of this apparatus is a continuous stream of particles with a size ranging between 10 nanometers to 5 microns (column 2, lines 41-60). Akedo fails to explicitly teach how the particles are produced. However, Bi teaches an apparatus that reacts a reactant stream by directing a focused radiation beam at the reactant stream to produce a product stream comprising particles downstream from the radiation beam, wherein the reaction is driven by energy from the radiation beam (summary). The product stream of this apparatus is a continuous stream of nanoparticles. The benefit over the prior art in using this method in order to produce nanosized particles is the efficient use of resources at high production capacity without sacrificing particle quality (column 2, lines 16-24). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to have the Bi apparatus provide the nanoparticle input of

the Akedo apparatus (reference 23, figures 6 and 9). The references collectively fail to explicitly teach performing this in an in-line method.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Akedo in view of Bi in an in-line fashion (having the product stream of Bi be directed to the input of the Akedo reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits of the efficient use of resources at high production capacity without sacrificing particle quality. The method that results meets the applicant's claims, as has been discussed in previous Office Actions.

Claim 30, 43, 45, 52, and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lehman (US 6,097,144) in view of Akedo et al. (US 6,280,802 B1), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134) in further view of Kambe et al. (WO 99/23189).

Lehman teaches a process of producing a glass coating that involves applying frit to a cold or heated substrate. The process is performed by mixing the frit, having a 200-325 mesh size, with a carrier solvent and the spraying the coating to the surface (column 5, lines 50-67). If the substrate is cold, a series of heating and cooling steps

are performed in order to melt, fuse, and anneal the glass coating (column 6, lines 1-20). Lehman fails to use the method of applicant's claim 18 to apply the glass coating. However, Bi teaches that nanoparticles exhibit exploitable chemical and mechanical properties that are different from larger sized particles (background), and that the taught apparatus is advantageous to use in order to produce these nanoparticles due to its efficient use of resources (column 2, lines 17-25). An additional obvious benefit of having the particles be of a smaller size would be the ability to form thinner, or more uniform, films of glass. The Akedo, Bi, and Rao references can be combined as taught previously in order to produce coatings by nanoparticles, and therefore it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the method taught by Akedo, Bi, and Rao in order to apply the glass coating of the Lehman process in order to reap the benefits of a thinner, or more uniform, coating. Additionally, the combined process would be more efficient as a carrier solvent would no longer be required. The Kambe reference is used in order to establish that the combined Bi and Akedo apparatus is capable of producing glass particles. Kambe teaches a similar apparatus as Bi, as nanoparticles are produced by laser irradiation. The differences between Kambe and Bi are in the process that the particles perform after they are produced, and not in how they are produced. The nanoparticles produced in the Kambe apparatus is silica (abstract), which can be used for producing glass. It would have been obvious from the Kambe reference that the apparatus taught by Bi would also be able to produce silica nanoparticles. Furthermore, it would have been obvious that the combined Akedo and Bi apparatus is able to produce silica coatings as

well, as column 5, first paragraph of the Akedo reference teaches that the apparatus taught is capable of producing oxide films.

In performing this process, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use a silicon precursor in order to achieve silicon oxide as the product stream.

Claims 18-29, 33-52, and 56-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akedo et al. (US 6,280,802 B1) in view of Kambe et al. (WO 99/23189) and Rao et al. (US 5,874,134):

Akedo teaches the limitations as shown above, specifically to deposit nanoparticles of oxides onto a substrate, but fails to explicitly teach using the process of Kambe as the input of the method. However, Kambe teaches the production of silicon oxide particles by a process shown above. To use the process of Kambe to provide the input of Akedo would have been obvious as the process of Kambe provide a high level of purity (page 1, lines 30-35) and efficiency (page 2, lines 1-5). The combined references fail to teach performing the process in-line.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Akedo in view of Kambe in an

in-line fashion (having the product stream of Kambe be directed to the input of the Akedo reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits a high level of purity and efficiency. The method that results meets the applicant's claims.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lehman (US 6,097,144) in view of Akedo et al. (US 6,280,802 B1), Kambe et al. (WO 99/23189), and Rao et al. (US 5,874,134).

Lehman teaches a process of producing a glass coating that involves applying frit to a cold or heated substrate. The process is performed by mixing the frit, having a 200-325 mesh size, with a carrier solvent and the spraying the coating to the surface (column 5, lines 50-67). If the substrate is cold, a series of heating and cooling steps are performed in order to melt, fuse, and anneal the glass coating (column 6, lines 1-20). Lehman fails to use the method of applicant's claim 18 to apply the glass coating. However, the Akedo, Kambe, and Rao references can be combined as taught previously in order to produce coatings by nanoparticles. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the method taught by Akedo, Kambe, and Rao in order to apply the glass coating of the Lehman process in order to reap the benefits of a thinner, or more uniform, coating that is possible with smaller diameter particles. Additionally, the combined process would be more efficient as a carrier solvent would no longer be required.

Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (US 6,074,888) in view of Lehman (US 6,097,144), and further in view of Akedo et al. (US 6,280,802 B1), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134), in view of Kambe et al. (WO 99/23189).

Tran teaches that in order to produce an optical component, it is required to produce an optical component layer (abstract, summary), which is typically glass. Then photolithography is used to fabricate the optical component (column 3, line 59). Tran fails to teach applying the coating by the method taught by applicant's claim 18. However, it has been shown that the Lehman, Akedo, Bi, Rao, and Kambe references can all be combined to teach a method of producing a glass coating that has the advantages of being more uniform, is capable of being thinner, and does not require a solvent. To use this method of forming a glass coating when producing the optical layer taught in the Tran reference would have been obvious at the time the invention was made to a person having ordinary skill in the art in order to reap the benefits of a thinner, more uniform, coatings without the need for a solvent.

Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (US 6,074,888) in view of Lehman (US 6,097,144), and further in view of Akedo et al. (US 6,280,802 B1), Kambe et al. (WO 99/23189), and Rao et al. (US 5,874,134).

Tran teaches that in order to produce an optical component, it is required to produce an optical component layer (abstract, summary), which is typically glass. Then

photolithography is used to fabricate the optical component (column 3, line 59). Tran fails to teach applying the coating by the method taught by applicant's claim 18. However, it has been shown that the Lehman, Akedo, Kambe, and Rao references can all be combined to teach a method of producing a glass coating that has the advantages of being more uniform, is capable of being thinner, and does not require a solvent. To use this method of forming a glass coating when producing the optical layer taught in the Tran reference would have been obvious at the time the invention was made to a person having ordinary skill in the art in order to reap the benefits of a thinner, more uniform, coatings without the need for a solvent.

Claims 18-29, 33-42, 47-51, 53, 54, 56, 57, and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Börner et al. (US 6,032,871) in view of Bi et al. (US 5,958,348) and Rao et al. (US 5,874,134).

Börner teaches a process of spraying two different materials to a substrate by applying differing charges to each particle stream (figure 3). Börner is silent to how these particle streams are produced. However, Bi teaches that nanoparticles exhibit exploitable chemical and mechanical properties that are different from larger sized particles, such as increased smoothness and thinner coatings (background). The apparatus taught by Bi is advantageous to use in order to produce these nanoparticles due to its efficient use of resources (column 2, lines 17-25). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the apparatus of Bi to produce the particle streams of Börner. By doing so,

one would reap the benefits of having an efficient way of producing nano-sized particles such that a smoother and/or thinner coating is achieved. The references fail to explicitly teach performing this in an in-line method.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Börner in view of Bi in an in-line fashion (having the product stream of Bi be directed to the input of the Börner reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits of the efficient use of resources at high production capacity without sacrificing particle quality. The method that results meets the applicant's claims, as has been discussed in previous Office Actions.

Claims 42-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Börner et al. (US 6,032,871) in view of Akedo et al (US 6,280,802), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134).

Börner teaches the desire to have powder coatings of two different materials applied to the same substrate by means of two differently charged particle streams. Akedo, Bi, and Rao, combined, teach a materially efficient method of producing charged particle streams that have the benefit of being nano-sized, which results in thinner

and/or smoother coatings, as explained above. Therefore, it would have been obvious to use the method and apparatus of Akedo, Bi, and Rao to provide the particle streams of Börner. By doing so, one would reap the benefits of an efficient way to produce smoother and/or thinner coatings. By figure 3 of Börner, one in the art would be motivated, when combing the references, to have a separate "Akedo and Bi" apparatus provide each stream. This is because the streams of figure 3 are coming from separate sources.

Claims 18-22, 26-29, 33-42, 44, 46-51, 53, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bi et al. (US 5,958,348) in view of Carey, Jr. (US 4,011,067).

Bi teaches a method of producing and collecting nanoparticles by means of a filter (substrate). Bi fails to explicitly teach moving the filter. However, Carey teaches that by moving the filter substrate, pressure drop in the gas stream is minimized and flowability of the gas stream through the filter is maintained (abstract). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to move the filter substrate in the process taught by Bi. By doing so, the pressure drop is minimized and flowability of the gas stream though the filter is maintained. Bi meets the limitations of the claims, as shown above.

(10) Response to Argument

The rejection of claims 18-21, 23, 25, 28-30, 43, and 44 stand or fall together, as indicated and argued by the applicant. This will be designated as Group 1.

The rejection of claims 22, 24, 26, 33, 35-38, 45-49, and 57 stand or fall together, as indicated and argued by the applicant. This will be designated as Group 2.

The rejection of claim 27 stands or fall alone, as indicated and argued by the applicant. This will be designated as Group 3.

The rejection of claims 31 and 32 stand or fall together, as indicated and argued by the applicant. This will be designated as Group 4.

The rejection of claims 34, 39-41, 50-52, 55, 56, and 58-61 stand or fall together, as indicated and argued by the applicant. This will be designated as Group 5.

The rejection of claims 42, 53, and 54 stand or fall together, as indicated and argued by the applicant. This will be designated as Group 6.

The examiner addresses the arguments against the rejections based on Akedo et al. in view of Bi et al. and Rao et al. as follows:

As to Group 1, Applicant argues hindsight reasoning, lack of motivation, and inoperability. These arguments are not convincing. Akedo requires an input of a nano-particle stream. Bi teaches a method of producing nano-particles with the explicitly taught benefit of high efficiency and quality. Figures 2-4 of Bi explicitly teach methods of forming particle streams, as collection of the particles is not shown in these figures. To use the particle stream produced by Bi as the particle stream required by Akedo would have been obvious at the time the invention was made to a person having

ordinary skill in the art. By doing so, one would reap the benefits of high efficiency and quality. This explicit motivation provides a *prima facie* case of obviousness that does not require hindsight reasoning. Examiner has additionally cited Rao of further evidence of performing the two processes of particle production and particle deposition continuously. One of skill would understand that the elimination of two steps that act in opposition to each other (collecting the particles out of a gas stream followed by supplying the particles to a gas stream) would be a benefit. As shown in previous Office Actions, this is analogous to operating a batch process continuously, which the courts have established as being non-patentable. *In re Dilnot* 138 USPQ 248 (CCPA 1963).

As to claim 18, Bi reads on every limitation absent moving the substrate. Moving the substrate certainly should not be considered a patentable limitation. Especially in view of Akedo, which teaches that a substrate being moved in a particle deposition process.

As to the applicant's arguments for inoperability, the minor pressure difference between "10 Torr", as taught by Bi, and "several Torr", as taught by Akedo, is not a convincing argument for inoperability. One of skill has the ingenuity to handle these minor pressure differences. Additionally, one of ordinary skill would know that gas flows from high pressure to low pressure. Since the pressure in Akedo is slightly smaller than Bi and the gas flows in that direction, the combination seems increasingly operable.

As to Group 2, applicant argues that Akedo fails to suggest how to modify the process to account for the elongated stream. This is not found convincing. Claim 22

does not require that the product stream be elongated, just the reactant stream. Bi explicitly teaches this in figures 2 and 4. Figure 7 of Bi also shows the product stream can be reshaped and redirected as needed. It would have been obvious, at the time the invention was made to a person having ordinary skill in the art to reshape and redirect the flow such that it is within usable parameters of the Akedo process.

As to Group 3, applicant's arguments are not found convincing. Moving the substrate relative to the reactant stream (as taught by Akedo) and moving the reactant stream relative to the substrate are functional equivalents.

Arguments against Group 5 are not found convincing. As shown in previous Office Actions, maximizing deposition rate is obvious and within the skill of one practicing in the art. Since the particle producing method taught by Bi is the same as the claimed invention, the method of Bi inherently would be capable of achieving such a rate.

Arguments against Group 6 are not found convincing. As shown in previous Office Actions, the courts have held that duplication of parts is not patentable. *In re Harza* 124 USPQ 378 (CCPA 1960). Using a second apparatus of Bi would double the particle production. This modification would have been obvious.

The examiner addresses the arguments against the rejections based on Lehman, Akedo, Bi, Rao, and Kambe as follows:

These arguments are all addressed above. Lehman and Kambe are used for teaching dependent claims 30 and 43, which stand or fall with claim 18. Claim 18 is does not require the additional teachings of Lehman and Kambe to be read upon.

The examiner addresses the arguments against the rejections based on Akedo, Kambe, and Rao as follows:

These arguments are all addressed above, as Kambe essentially teaches the same process as Bi, but additionally discloses the particles being silicon dioxide. This is not required for the broadest claim in any group.

The examiner addresses the arguments against the rejections based on Lehman, Akedo, Kambe, and Rao as follows:

These arguments are all addressed above. Lehman and Kambe are used for teaching dependent claims 30 and 43, which stand or fall with claim 18. Claim 18 is does not require the additional teachings of Lehman and Kambe to be read upon.

The examiner addresses the arguments against the rejections based on Tran, Lehman, Akedo, Bi, Kambe, and Rao as follows:

As to Group 4, applicant argues that Tran fails to make up for the deficiencies of Bi, Akedo, and Rao. However, as shown above, Akedo, in view of Bi and Rao,

establishes a *prima facie* case of obviousness for claim 18. As to claim 31, Tran is used to show that optical components generally require depositing a glass coating. The examiner has shown that the process of Bi and the process of Akedo, used together, produce high quality glass coatings in an efficient manner. Therefore, the combination would have been obvious and reads on the applicant's limitations.

The examiner addresses the arguments against the rejections based on Tran, Lehman, Akedo, Kambe, and Rao as follows:

As to Group 4, applicant argues that Tran fails to make up for the deficiencies of Kambe, Akedo, and Rao. However, as shown above, Akedo, in view of Kambe and Rao, establishes a *prima facie* case of obviousness for claim 18. As to claim 31, Tran is used to show that optical components generally require depositing a glass coating. The examiner has shown that the process of Kambe and the process of Akedo, used together, produce high quality glass coatings in an efficient manner. Therefore, the combination would have been obvious and reads on the applicant's limitations.

The examiner addresses the arguments against the rejections based on Borner, Bi, and Rao as follows:

Applicant's arguments are not found convincing. Borner requires a particle stream and Bi teaches a way to produce a particle stream. Bi explicitly teaches the motivation on why one would choose to use the process of Bi in producing particles.

This certainly does not require hindsight reasoning. Borner is analogous art as both Borner and the present invention are pertinent to particle deposition processes.

The examiner addresses the arguments against the rejections based on Borner, Akedo, Bi, and Rao as follows:

These arguments are not convincing. Borner is relevant, as shown above. Borner is essentially used to show that multiple product streams allow for more deposition area and increased deposition rate. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize multiple product streams in order to increase deposition rate.

The examiner addresses the arguments against the rejections based on Rao and Bernecki as follows:

This arguments have been found convincing and the rejections based on Rao in view of Bernecki have been withdrawn. However, Groups 1-6 are all still rejected under other grounds of rejection.

The examiner addresses the arguments against the rejections based on Bi and Carey as follows:

These arguments are not found convincing. Bi teaches all the limitations of claim 18, absent the moving of the substrate. Bi does teach that in order to maintain the pressure, the process must be stopped, filter removed, particles cleared from the filter,

the filter replaced, and the process switched back on. Carey teaches that in order to maintain the pressure through the filter, thus maintaining the flow rate of the stream, the filter should be moved in order to expose new surfaces, thus allowing the process to run continuously. This solves a problem that arises in the Bi reference. Therefore, Carey is certainly considered analogous art. All other arguments parallel those of above. These have been addressed above.

Because applicant's arguments have not been found convincing, the rejections of the above are maintained.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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Conferees:

Timothy H. Meeks

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